Foundations '02 Plenary Sessions

Foundations '02 had three plenary sessions: 1) an opening morning session with welcomes, three keynote presentations, and administrative information; 2) an afternoon one allowing sharing of insights from half of the Foundations '02 invited paper and special interest topic sessions; and 3) a closing afternoon session that allowed sharing of insights from the other half of the invited paper and special interest topic sessions, presented initial thoughts on the synopsis of modeling and simulation verification and validation (V&V) research needs, and the last keynote presentation. This document contains material presented by the moderator in the plenary sessions, notes from the insight sharing, and background/bio information about the primary Foundations '02 leadership and the four keynote speakers. It identifies the topics for the keynote presentations [file names for the keynote presentations use: "AppD#_presenter name"]and for the V&V research synopsis [file name: "AppD5_research synopsis"]. Some slides in the keynotes have annotation in the notes pages, and some of the briefings use automated advance in the Power Point versions (slideshow view). For reader convenience, we provide the slides in both pdf and PowerPoint formats.

Moderator material from all plenary sessions (pertinent slides are interspersed in the text) Background/bio information about Foundations '02 Leaders & Keynote Speakers may be found at the end of this document. Links to keynote briefs are immediately below for convenience.

> **Anthony Cerri**, Experimentation Engineering Depart M&S Division Chief, Joint Forces Command
> *V&V Experiences from MC02 & Joint Experimentation: the Good, the Bad, & the Ugly (PowerPoint)*

> **David Crandall**, Dept of Energy Defense Programs
> *The Essential Role of Credible Correct Simulation in Assuring the Safety of America's Nuclear Stockpile*

> **Linda Rosenberg**, NASA Chief Scientist for Software Quality Assurance
> *Software Quality Assurance at NASA (PowerPoint)*

Closing Keynote: *The Road to the Future – How to Implement Needed Research (PowerPoint)*
> **Randall Shumaker**, UCF Institute for Simulation and Training Director

Foundations '02 Opening Plenary Session Tuesday (October 22nd) Morning
This document contains both slides used and approximate comments made.

Slide 1: Welcome to Foundations '02

Welcome to Foundations '02

October 22-24, 2002

Johns Hopkins University Applied Physics Laboratory
Laurel, Maryland USA

Moderator: Dr. Dale K. Pace
Foundations '02 Program Co-chair

Moderator - 1

Welcome to Foundations '02. It's time for us to get started. Let me introduce myself – I'm Dale Pace, one of the Foundations '02 Program Co-chairs, and I will be the moderator for this opening plenary session.

Slide 2: Foundations '02 Sponsors

Foundations '02 Sponsors

ACM TOMACs
Aegis Technology Group, Inc.
ASME/AMD
ACIMS
Boeing Phantom Works
CentER, Tilburg University (Netherlands)
Clemson University
DMSO
FAA Flight Standards Service
Gesellschaft für Informatik (Bonn, Germany)
Illgen Simulation Technologies
IMC
JHU/APL
JASA
JANNAF M&S Subcommittee

McLeod Institute of Simulation Sciences – CSU/Chico
MoD (UK) Synthetic Environment Coordination Office
MSIAC
NASA Ames Research Center
NIST
NTSA
ONR
Shodor Education Foundation, Inc.
SISO
SCS
SURVIAC
USACM
UCF/IST

Moderator - 2

Foundations '02 has the honor of being sponsored by 28 organizations which recognize the need for significant technical improvement in modeling and simulation verification and validation. Ten of these are government organizations, six are professional societies concerned with modeling and simulation, eight are academic institutions, and four are from industry. I think that it is significant that not only are several of the professional societies sponsoring Foundations '02 international in scope, but three of the other sponsors are from outside the US: one each from Germany, the Netherlands, and the United Kingdom. Seldom does a workshop have such a broad base of sponsorship. These organizations endorsed the vision of Foundations '02 to

address this important subject (M&S V&V) by a workshop that is structured very differently from a normal conference and even differently from most workshops. Sponsor encouragement for appropriate participation is the major reason that so many have put forth the efforts that enable Foundations '02 to achieve its goals (I will say more about our goals later). Four of these sponsors merit special mention. The Defense Modeling and Simulation Office (DMSO) has been the primary *initiating sponsor* for Foundations '02, providing the General Chair for Foundations '02 – Ms. Simone Youngblood (DMSO's lead for VV&A) and hosting Foundations '02 papers on its website. The Modeling and Simulation Subcommittee of the Joint Army Navy NASA Air Force (JANNAF) Interagency Propulsion Committee is the other *initiating sponsor* for Foundations '02. The National Training Systems Association (NTSA) is the *hosting sponsor* for Foundations '02, providing the administrative support needed to make this event work smoothly. And the Johns Hopkins University Applied Physics Laboratory (JHU/APL) has provided the facility in which we are meeting.

It is now my privilege to introduce Dr. David Kalbaugh, Assistant Director of the Johns Hopkins University Applied Physics Laboratory, who will welcome us to APL for Foundations '02.

Slide 3: APL Welcome

JHU/APL Welcome

Moderator - 3

Kalbaugh Remarks: On behalf of Dr. Roca, the APL Director, myself, the APL staff, and the Johns Hopkins University, I welcome you to the APL Kossiakoff Conference and Education Center. We hope that these facilities will help your important workshop achieve its goals. We at APL understand the important role that models and simulations play in system design and evaluation because we use models and simulations extensively in all aspects of our endeavors – from the missions we support reaching far into space to our support of American defense endeavors. We know how critical it is to understand the accuracy and fidelity of our models and simulations so that we can determine what level of credibility to place in their results, to know where we must invest in additional test and experimentation and where we can trust the model and simulation results without such additional expenditure of resources. The art of verification and validation, V&V, plays an important role in this, and we need to advance V&V from being

mainly an art form to being more scientific and systematic. That is why APL is glad to have Foundations '02 meet here, because we believe you will make significant contributions to the transformation of V&V from art to science. If there is anything that we can do to help Foundations '02 achieve its goals, just let us know and we will do what we can. I wish you well in this important undertaking.

It is now my privilege to introduce Ms. Simone Youngblood, DMSO's lead for VV&A, who will welcome us to the task that lies before us. CAPT Michael Lilienthal, Director of DMSO, had wanted to be here to welcome you, but, unfortunately, he has NATO commitments abroad that keep him from being with us. Col Mike Finnern, DMSO's Deputy Director for Policy, had been scheduled to give the DMSO welcome but the traffic tie-up due to the sniper incident this morning kept him from being able to be with us.

Slide 4: DMSO Welcome

DMSO Welcome

"...fostering the **interoperability**, **reuse**, and **affordability** of M&S and the **responsive** application of these tools..."

The Defense Modeling and Simulation Office (DMSO) is the catalyst organization for Department of Defense (DoD) modeling and simulation (M&S) and ensures that M&S technology development is consistent with other related initiatives.

Moderator - 4

Youngblood Remarks: On behalf of the DMSO Director and staff, I welcome you to Foundations '02. I am delighted that I will have a chance to participate in the workshop personally along with you. This workshop has taken two years to gestate. The stimulus for it began with a suggestion in September 2000 from Dr. Steve Stevenson of Clemson University, one of Foundations '02 Program Co-chairs, to the DoD Verification, Validation, and Accreditation (VV&A) Technical Working Group (TWG) (which is chaired by the DMSO VV&A leader) that an event was needed which would bring V&V people together from diverse communities to address technical issues of V&V. The TWG tasked Dr. Pace to work with Dr. Stevenson to develop the concept for that event, and over the next several months the TWG helped that concept to mature into the plan for Foundations '02 and facilitated its exposure to the DoD Modeling and Simulation Working Group (MSWG). Many of the people here today are from the VV&A TWG or were encouraged by its members to participate in Foundations '02 because they know the need for technical V&V advances.

DMSO understands and appreciates the importance of correct and credible models and simulations. We have worked long and hard to help the Defense community develop policies which ensure that VV&A will be an important aspect of simulation development and use. We have developed VV&A guidance to help the defense community implement its VV&A policies, and made that guidance easy to access with the web-based *Millennium Edition* of the *VV&A Recommended Practices Guide* (commonly just called the *RPG*). And we know the great need for technical V&V advances, which is why DMSO has been delighted to be the primary *initiating sponsor* for Foundations '02. I encourage each of us to roll up our sleeves and to work hard while we are at this workshop so that we will make the contributions to V&V technology that is Foundations '02 goal.

Slide 5: Why We are Here

Why We Are Here

Foundations '02 TOR: to address four needs

- **Clear & comprehensive description of the state of the V&V art.**
- **Current bibliography of critical and substantive V&V literature and resources.**
- **Comprehensive and coherent statement of M&S V&V research needs.**
- **Substantial and sustained information exchanges about V&V by various M&S communities so that "best practices" may be employed by all and appropriate standard procedures become common throughout all M&S communities.**

Moderator - 5

As noted in its Terms of Reference (TOR), Foundations '02 was designed to address four very specific needs. The need for:

1) Clear & comprehensive description of the state of the V&V art.
2) Current bibliography of critical and substantive V&V literature and resources.
3) Comprehensive and coherent statement of M&S V&V research needs.
4) Substantial and sustained information exchanges about V&V by various M&S communities (such as DoD, DOE, NASA, industry, professional societies, and academia) so that "best practices" may be employed by all and appropriate standard procedures become common throughout all M&S communities.

How We Expect to Meet the Needs

- **Articulation of the State of M&S V&V Art:**

- **Substantive papers by knowledgeable V&V practitioners in particular areas**

- **Robust discussion of those papers**

  (=> people need to be in the entire session, not floating from one room to another)

- **Publishing both papers and synopses of their discussion**

- **An up-to-date VV&A bibliography on DMSO website**

- **Synopsis of research needs from papers & discussions**

- **Significant representation for diverse communities are here**

Moderator - 6

Meeting these needs is the goal of Foundations '02. We have largely met the second need already. An up-to-date bibliography of M&S VV&A literature is available on the DMSO website. This bibliography currently has more than 600 entries, most published since the mid-1990s, and is in Excel spreadsheet format to facilitate searching it for items or topics of particular interest.

To articulate the state of the art for modeling and simulation (M&S) verification and validation (V&V), we structured Foundations '02 in a rather novel way. For the invited paper sessions, we solicited a substantive paper from a world-class expert (or group of experts) to identify the state of V&V in a particular topic, to indicate what can be done (and what cannot be done) with current capabilities, and to identify research needs in that area. Authors will have time to meaningfully present their papers (about 90 minutes in each topic area). Then those papers will be discussed for about the same length of time to identify caveats, alternative perspectives, etc. We will capture that discussion and publish a synopsis of it along with the paper as the way of articulating the state of V&V art in a particular area. We deliberately separated discussion leadership (session chairs) from the content developers (paper authors) to encourage robust and thorough probing of the topics.

This approach to accomplishing our objectives makes us different from most conferences in which people frequently float from one session to another – that kind of action is at odds with our purpose. So we ask that you stay in the session for its duration and contribute your insights to the discussion. You will be able to get the insights developed in the other sessions from the proceedings, and you will know who to contact if you want to pursue any of the topics at greater length. We thank you in advance for your cooperation in this.

Except for the area of computational science and engineering, there are no college textbooks on M&S V&V. There are a multitude of V&V papers in conference proceedings and journals plus a few chapters in M&S texts and handbooks. We need a more solid foundation upon which to build M&S V&V technically. We believe that publication of the proceedings for Foundations '02 will make an important step toward filling this literature lack. The proceedings will contain all Foundations '02 papers and presentations, synopses of discussion, and more (background material such as the TOR, sponsor identification, list of participants, etc.). The proceedings will be published on CD by The Society for Modeling and Simulation International (SCS) and are expected to be available by mid-December. The cost for this CD is expected to be $30, but we have a special arrangement for those ordered at this workshop: they cost only $20 and will be mailed to you when they are published. You can order one for yourself and some for your colleagues at the registration desk (the last page in the program is an order form for those who want to order the CD after Foundations '02). The Foundations '02 products will also be available from the DMSO website. Because there will be hundreds of MB of material, tt will simply be simpler for most people to have a CD instead of trying to download that much material.

We will develop a coherent synopsis of M&S V&V research needs, drawing upon needs identified in the papers and from session discussions. The closing plenary session will provide an opportunity for your inputs in this regard as Steve and I share our thoughts on this subject. The T3 session on V&V research is charged with drafting some ideas to stimulate us in this area. This coherent synopsis of M&S V&V research needs will be communicated to appropriate parties in the government, professional societies, academia, and industry.

Slide 7: Improved Communication Across Diverse Communities

Improved Communication Across Diverse Communities

- Defense (government & contractors)
- Academia
- DOE, NASA, NIST, FAA
- Other Industry
- Non-US
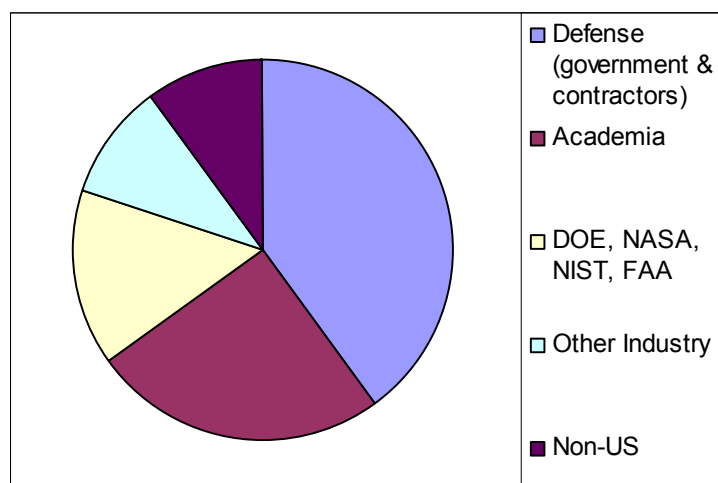
We believe that Foundations '02 will serve as a stimulus in meeting the need for improved communication across community boundaries. Participation in Foundations '02 is more diverse than in most meetings concerned with V&V. You can tell that simply by looking at the affiliation of authors and session leaders in the Foundations '02 program. Based upon my review of affiliations of 169 people registered for Foundations '02 a week before the workshop, about 40% of our participants are from the Defense community (government and its supporting contractors), about 25% are from academia (many of whom support government agencies), 15% are related to the Department of Energy and its Accelerated Strategic Computing Initiative (ASCI) program or from other government organizations (NASA, FAA, NIST), 10% are from other industry organizations, and 10% are from abroad (Belgium, Canada, France, Germany, and the UK). Some of the people involved could be listed in more than one category, and my identification may have been imperfect, but this provides an indication of the community distribution at Foundations '02.

Slide 8: Ingredients for Success

Ingredients for Success

What we need to satisfy Foundations '02 goal:

1) **Top-notch substantive papers**

    We have those – as you have seen

2) **Knowledgeable people to discuss the papers/topics**

    You are here – every session has good people

3) **Proceedings to share the insights**

    The CD & website planned will facilitate this

4) **Continuing communication across community boundaries**

    You can make this happen!

For Foundations '02 to achieve its goal, four ingredients are required. First, we needed substantive papers from world-class experts – we got them! My head still aches from reading the papers – they have so much substance. Second, we needed a diverse set of knowledgeable people to discuss the papers and topics – we got them! You are here. Third, we needed a way to share the insights we produce so that there will be the equivalent of college textbook materials for M&S V&V – we will have that with the proceedings that will be available on the CD and the DMSO website. Finally, we need for the communication across community boundaries that is started here to continue -- and for that to happen, we have to depend upon you. You can enable us to achieve that part of the Foundations '02 goal.

Expected Impact of Foundations '02

- Proceedings will facilitate adoption of best
  practices by individuals and organizations

- Coherent & comprehensive summary of
  M&S V&V research needs will shape what
  is done in the next few years

Moderator - 9

I think that Foundations '02 is going to have a significant impact on modeling and simulation V&V. I think that having the information in a single spot that will be in the Foundations '02 proceedings will make it easier for individuals and organizations to improve their V&V practice and to comply with the best practices available. In addition, development of a coherent and relatively comprehensive statement of research needs to advance M&S V&V will help to shape the direction that V&V research endeavors take in the next several years. So I am excited about the prospect of Foundations '02's impact.

Slide 10: Acknowledgments

Acknowledgments

General Leadership:

Simone Youngblood, Dale Pace, & Steve Stevenson

Content Producers: **Authors (and their bosses & sponsors)**

Discussions (lead, capture, synopsize): **Co-chairs & Recorders**

Stimulators: **Keynote Speakers**

Administrative Support: **NTSA & DMSO**

Moderator - 10

Before we turn to our keynote speakers, I want to acknowledge some who have made Foundations '02 possible. First, three of us have worked hard for the past two years to bring Foundations '02 to where it is today: Simone Youngblood (General Chair) and Steve Stevenson and myself as Program Co-chairs – background information about us is at the end of this document. Next I want to recognize the people who have put forth the hard work to provide the basic content for our considerations: the authors. These men and women have done a great job. I also want to praise them for bringing to fruition the Foundations '02 vision. We started nearly two years ago with plans for 20 sessions (12 invited paper topics and 8 special interest topics): **19 of those came through!** That's a much higher percentage than is normal for a conference or workshop, and it is due to the dedication of our authors **and the support of their bosses and sponsors**. Next I want to acknowledge the important role that the session chairs and recorders will play in moderating the discussions, making sure that the discussions are robust, and then capturing those discussions and writing synopses of them so that the rest of us can benefit from them as well. I also want to thank in advance our keynote speakers for helping us to focus and providing greater appreciation for the importance of our undertaking in Foundations '02. Finally, we should recognize those important behind-the-scenes folks who keep the wheels moving smoothly: Barbara McDaniel, Patrick Rowe and others at NTSA for their work with registration and general publicity about Foundations '02, and for the collection of people at DMSO (especially Simone's assistant, Lynda Olson) who got materials on the website for Foundations '02 from the earliest posting of the TOR and bibliography to the current collection of papers and the future posting of Foundations '02 products. Let's give all of these a great round of applause for what they have done to make Foundations '02 possible.

Slide 11: Keynotes

Keynotes

The Importance of Credible M&S for the Defense Community
    Anthony Cerri
    Experimentation Engineering Dept M&S Div. Chief,
    Joint Forces Command

The Essential Role of Credible Correct Simulation in Assuring the Safety of America's Nuclear Stockpile
    David Crandall, Dept of Energy Defense Programs

Software Quality Assurance at NASA
    Linda Rosenberg
    NASA Chief Scientist for Software Quality Assurance

We are now going to turn our attention to our keynote speakers. I will return with comments and specific instructions for us after the keynote presentations and before we break for lunch.

Foundations '02 is different from many conferences and workshops in that we have a specific product that we expect to produce and in the substance of our papers and their discussion. We are also different in that we have three keynote speakers to stimulate and focus us. There are several reasons for having multiple keynote speakers. First, they come from different communities, and their presence is a reminder of our need to communicate our insights across community boundaries. Second, I think each one will bring a different perspective on the importance of correct and credible simulations and the ways that we can improve our capabilities in these areas. Your program has more information about our keynote speakers than I will say when I introduce each one. We appreciate them helping Foundations '02 achieve its goal.

Keynote speaker backgrounds are contained at the end of this document.

Keynote Speaker Presentations

Slide 12: Important Perspective

An Important Perspective

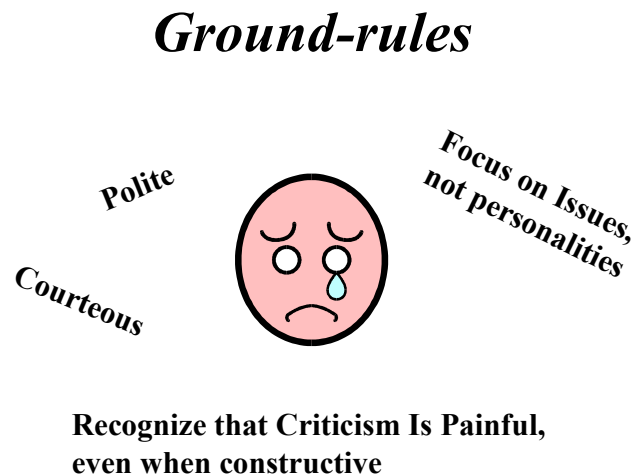**Not important:** number of people in the session

Important:	thorough and robust discussion of the topic
Important:	stay off hobby horses and focus on significant issues for V&V in the topic.

Moderator - 12

We appreciate the way our three keynote speakers have stimulated us, and challenged us. Now it is up to us to make sure that Foundations '02 achieves its goals. We are off to a grand start with the bibliography and a great set of substantive papers. Now we have to take those papers and probe them, to put them in a broad perspective and make sure that they are properly appreciated. That's where the discussion by knowledgeable people has a vital role in Foundations '02. Two of our sessions are large (A2 on Selected Validation Methods and B1 on V&V in Computational

Science and Engineering): 40-50 people in each of them, and they will be held in this auditorium this afternoon and tomorrow morning. The rest of the sessions are smaller, most 15-20 people in the session. The number of people in a session is relatively unimportant. Actually, in many ways, smaller may be better. A smaller group (if it has both diverse and knowledgeable people in it) may facilitate more thorough discussion of the topic than a larger group. What is important is that the topic get thoroughly discussed and that discussion get captured and reported so that it plus the invited paper can provide robust articulation of the state of V&V art from simulation in that arena. This means that each of you has a responsibility to make sure that no stones are unturned in discussion of the topic. It also means that each of us is responsible to stay off our hobby horses and focus on the really important aspects of V&V for M&S in the topic.

Slide 13: Ground-rules

Ground-rules

Polite

Courteous

Focus on Issues, not personalities

Recognize that Criticism Is Painful, even when constructive

A few ground-rules. Let's all be polite and courteous, even if we are passionate about the subject. Let's deal with the issues in a professional way. We have deliberately chosen discussion leaders who come from different camps than the authors, and who in some cases have philosophical differences with the authors. Discussion of a topic by such people should ensure that we find any caveats or limitations in the invited papers – and there will be some. The invited papers are great, but none of the authors has a complete and perfect grasp of their topic – not even the best is at that level. I think all of our authors would agree with the idea that there is room for improvement in their papers, and that is the goal of our discussions, even though it is going to be painful for every one of us who has the natural pride of authorship and bias for our own way of understanding the subject and expressing it. We must remember that criticism is always painful, even when the criticism is constructive. As one of the authors, I expect to feel the pain as my toes are stomped upon in discussion of the topic of my paper, but my objective (which I believe is shared by the other authors) is the best product in the end. So I will grin and bear it.

Slide 14: Session Responsibilities

Session Responsibilities

Session Chairs:

- **Identify participants (have people sign attendance sheet)**
- **Introduce themselves (and participants if not too many)**
- **Turn the session over to the authors for presentations**

Authors: **Present their material (& participate in its discussion)**

Session Chairs: **Moderate/stimulate topic discussion**

Session Chairs/Recorder: **Capture the discussion**

Prepare a synopsis of the discussion (Thursday mainly)

They should not leave until Pace has a discussion synopsis!

Help! A few Chairs/Recorders could not be here – help the session leaders with notes about the discussion (Thanks!)

Moderator - 14

The Session Chairs will welcome people to the session, pass the attendance list so that we will know who was in each session. The chairs will identify themselves, and if there are not too many people in the session, ask each to identify him or herself. Then the chairs will turn the session over to the authors to make their presentations – the authors will identify themselves, saying what is important about themselves relative to the topic. After the presentations, the chairs will moderate (and where appropriate stimulate) discussion of the topic. The chairs and the recorder will be responsible for capturing that discussion and preparing a synopsis of it. Drafting that synopsis may occur on Thursday, but some chairs and recorders may work on their synopses before then. Authors and others are welcome to help the chairs and recorders with this. **The important point is that the chairs and recorders should not leave here until I have a synopsis of the discussion in the session.** I prefer the synopsis in electronic format (on a disk or CD), but will take it on paper if that is the only way to get it before people leave.

A few people who planned to be chairs or recorders for the sessions have not been able to attend. That's always a problem for any meeting, and is one of the reasons we planned for two co-chairs and a recorder for each session. However, to help those sessions where one of the leaders is missing, will you assist them in capturing the discussion with notes (especially the particular your own comments were phrased) so that it will be easier for them to prepare the discussion synopses. Again, we thank you in advance for your cooperation.

Slide 15: Session Assignments (slide not shown or discussed here)

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Slide 16: Participant Distribution Among Sessions

Session Distribution
(as of October 15th)
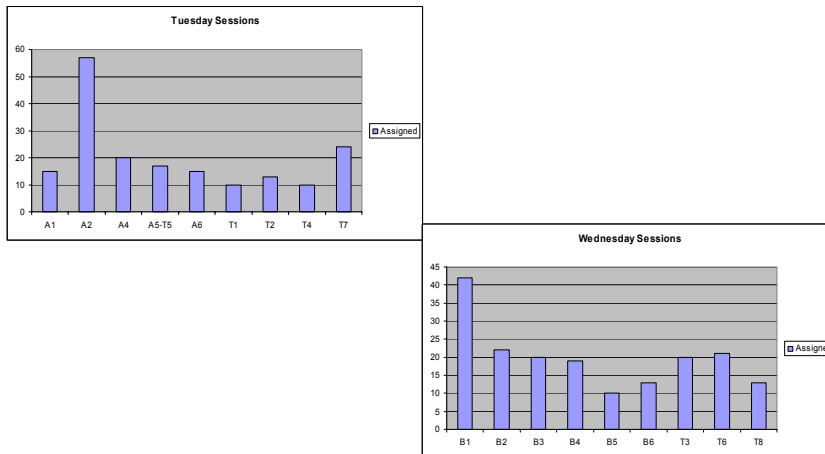
Moderator - 16

This slide provides a general indication of how people are distributed among the sessions (it is based upon assignments for about 180 people made mid-day Friday). Except in a few instances, we were able to assign people to their first preference in sessions. Many people made agonizing choices because they wanted to attend more sessions than the two allowed – and it has been hard to decide which is most important. The proceedings will help to ease that pain since the proceedings will provide the insights from the sessions that you could not attend. We worked hard to keep the cost of the proceedings low so that they can be widely distributed and be helpful to many in the community. Be sure to place your order while here, and tell others about the proceedings when you leave. We also put a copy of the order form in the back of the program so that you can copy that and give it to others who would benefit from the proceedings.

Slide 16: Administrative Comments (not included in this document)

Tuesday & Wednesday Afternoon Plenary Sessions

As part of each afternoon plenary session, the invited paper and special interest sessions were polled for V&V insights that they felt had broad applicability. Only those who had been in the session were allowed to speak during the time allotted for the session. Usually the speakers focused mainly on what was discussed in the session. The following were half-dozen points selected by the Foundations '02 Program Co-chairs from what they heard participants say during these periods and from review of notes taken by several individuals who had been tasked to capture the essence of what was reported during these periods. Fuller discussion of these points (and other points) may be found in the papers and discussion synopses for the sessions.

- The primary motivation for M&S V&V is risk reduction, i.e., to ensure that the simulation can support its user/developer objectives acceptably. This provides the benefit side for the cost-benefit concern about V&V, which is the core issue in the question of how much V&V is needed.
- Effective communication is a problem because there continues to be confusion and controversy about terminology, concepts, and V&V paradigms – and excessive use of acronyms makes it even more difficult to communicate across community boundaries.
- Advances in the M&S framework/theory can enhance V&V capabilities, and is essential for increasing automated V&V techniques.
- Material presented was good, but often needed to be taken a step farther with explicit application examples to clarify how such can be used effectively – especially with regard to formal methods, adaptive processes, and statistical processes (especially in the "light-weight" versions of these which hold promise for affordable application in V&V).
- Limitation in items required for effective V&V (required data and detailed characterization of associated uncertainties and errors, simulation/software artifacts, etc.) have to be faced and addressed, with many of the management processes for coping with them being common in many areas of simulation application.
- Cost and resource requirements for M&S V&V are not as well understood as they need to be because the meaningful information about such is not widely shared within the M&S community, and much more information about cost and resource requirements need to be collected and made available to facilitate development of more reliable estimation processes.
- Many areas of M&S V&V need to employ more formal (repeatable and rigorous methods) to facilitate better judgments about appropriateness of simulation capabilities for intended uses.

On Wednesday afternoon, preliminary thoughts about M&S V&V research needs were presented by Dr. Stevenson and the closing keynote address on *The Way to the Future* was presented by Dr. Shumaker.

Foundations '02 Leaders & Keynote Speakers

Foundations '02 Leadership

General Chair: **Simone Youngblood** (DMSO)
Program Co-chairs: **Dale Pace** (JHU/APL) and **Steve Stevenson** (Clemson)

Simone Youngblood is a member of the Principal Professional Staff at the Johns Hopkins University Applied Physics Laboratory (JHU/APL). For the past five and a half years, Ms. Youngblood has served as the DoD VV&A focal point in her position as DMSO's VV&A Technical Director. Leveraging an extensive background in simulation development, modification and application, Ms. Youngblood has been active in the VV&A community for the past ten years. Ms. Youngblood is active in numerous organizations which focus on VV&A. From 1994 to 1997, she served as Chair of the DIS VV&A Sub-Group and was co-author and editor of the IEEE 1278.4 "Recommended Practices Guide for Distributed Interactive Simulation - Verification, Validation, and Accreditation." From 1997 to the present, Ms. Youngblood has served as the chair of the SIW VV&A Forum. Ms. Youngblood is also active in the Society for Computer Simulation and the Military Operations Research Society. Ms. Youngblood has a BA in Mathematics as well as a BS and an MS in Computer Science.

Dale K. Pace is a member of the Principal Professional Staff of The Johns Hopkins University Applied Physics Laboratory and taught in Hopkins' graduate technical management program from the mid-1980s to the mid-1990s. Dr. Pace has led V&V endeavors within his own organization, at other Defense organizations, and across government departments. He has taught VV&A short courses for professional societies, government activities, and industry. He was an initial co-chair of the Distributed Interactive Simulation (DIS) VV&A group and was co-chair of the Military Operations Research Society (MORS) Simulation Validation (SIMVAL) 1999 Workshop. He is a member of the Defense Modeling and Simulation Office (DMSO) Verification, Validation, and Accreditation (VV&A) Technical Working Group and its VV&A Technical Support Team. He is *Simulation's* Associate Editor for Validation.
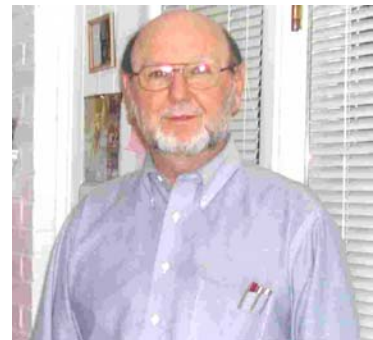
Professor D. E. Stevenson (know as `Steve' by everyone) received an A. B. in mathematics from Eastern Michigan in 1965, an M. S. in computer science from Rutgers in 1975, and a Ph. D. in mathematical sciences from Clemson in 1983. He is currently an associate professor of computer science at Clemson. He spent eleven years as an MTS at Bell Telephone Laboratories. He is a member of the ACM, Association for Symbolic Logic, and SIAM.   Professor Stevenson's research interests center around computational science, primarily involving the question of the computational foundations for scientific models. One question is the mathematical validity centering in constructive mathematics and development of programs from these constructions. The focus of all this research is "How do you know it's right?" The second question is a people question: how to educate the diverse scientific community in computational science. He is active in education as a member of the Shodor Education Foundation.

Tony Cerri is a Navy civil servant and the Modeling and Simulation (M&S) branch chief for the United States Joint Forces Command, Joint Futures Lab, J9, located in Suffolk, VA. He is responsible to ensure the M&S environment supports futuristic Joint experimentation concepts. In this capacity, he acted as the M&S Federation Manager for the Millennium Challenge 02 experiment completed in July '02. Other major experiments wherein Tony has been similarly involved include; J9901 – the first J9 experiment, Attack Operations 00, Unified Vision 01. Prior to his current position, he was a senior system analyst with Science Applications International Corporation and part of a team that transitioned the Synthetic Theater of War Advanced Concept Technology Demonstration to the Joint Semi-Automated Forces simulation. Previous work in the corporate world includes developing an integration program for U.S. Army, training-focused, automated information systems. He is a retired U.S. Army, Infantry, Lieutenant Colonel. Military awards include the Legion of Merit and the Bronze Star. He was awarded a Bachelor of Science from West Point in 1975, a Master of Science in Administration from Central Michigan University in 1990 and a Master of Science in Management from Florida Institute of Technology in 1995.

Linda H. Rosenberg, Ph.D.

Dr. Rosenberg serves as the Acting Assistant Director for Information Sciences / Chief Information Officer at NASA's Goddard Space Flight Center. She is matrixed from her position as Chief Scientist for Software Assurance for Goddard Space Flight Center (GSFC), NASA in the Office of Systems Safety and Mission Assurance Directorate and is the former division chief of the Software Assurance Technology Office (SATO). Dr. Rosenberg is a recognized International expert in the areas of software assurance, software metrics, requirements and reliability and serves on IEEE program committees in those areas. She has presented papers/tutorials and chaired sessions at many international conferences, included those sponsored by NASA, DOD, and AIAA. Dr. Rosenberg also serves as a reviewer for the Department of Defense sponsored conferences and other industrial organizations for software quality. Dr. Rosenberg is also an adjunct professor at University of Maryland, Baltimore for the Masters/Doctoral Program. Dr. Rosenberg holds a Ph.D. in Computer Science, an M.E.S. in Computer Science, and a B.S. in Mathematics. She is a member of Electrical and Electronic Engineers (IEEE), the IEEE Computer Society, the Association for Computing Machinery (ACM) and Upsilon Pi Epsilon.

Dr. David H. Crandall

Dr. Crandall is Assistant Deputy Administrator for Research, Development and Simulation, Office of Defense Programs at the National Nuclear Security Administration, U.S. Department of Energy. This is the principal office within the Department of Energy for nuclear weapons research in support of the Stockpile Stewardship Program. His experience includes 16 years of physics research and 20 years of science program management.

Dr. Crandall conducted experimental research from 1967 through 1983 investigating the physics of atomic collisions with emphasis on highly charged ions. This research was conducted at the University of Nebraska (thesis research), at the University of Missouri at Rolla (visiting professor), at the Joint Institute for Laboratory Astrophysics in Boulder, CO (post doctoral fellow), and at the Oak Ridge National Laboratory (researcher and program manager), with over 100 refereed publications. The basic physics measurements and insights from this research are applied in the fields of plasma physics, fusion energy and astrophysics. Dr. Crandall is a Fellow of the American Physical Society cited for his work on atomic collisions involving multiply-charged ions.

Since 1983, Dr. Crandall has been at the U.S. Department of Energy in Washington, D.C. He served as Branch Chief for Experimental Plasma Research and as Division Director for Advanced Physics and Technology in the Fusion Energy Program within the Office of Energy Research. Beginning in 1988, in his capacity as Division Director, he led the implementation of the Tokamak Transport Initiative. In 1995, he joined the Office of Defense Programs where he served as Director of the Office of the National Ignition Facility, Director of the Office of Inertial Fusion, and Director of the Office of Defense Sciences. He began his current position in the newly established National Nuclear Security Administration on March 6, 2000.

Wednesday Plenary Keynote Bio

Dr. Randall P. Shumaker

Dr. Shumaker is Director of the Institute for Simulation and Training (IST) at the University of Central Florida. With a staff of approximately 135 IST is among the largest groups in the US focusing on research in modeling and simulation. Prior assignments for Dr. Shumaker include Superintendent for Information Technology at the Naval Research Laboratory, Director of the Navy Center for Applied Research in Artificial Intelligence, and Program Element Manager for aircraft technology at the Naval Air Systems Command. He has wide experience in computer science and computer engineering, with particular interest in human-computer interaction, adaptive systems, and software assurance. He has lectured, taught and published on a wide variety of computing topic with particular focus on intelligent decision systems. He frequently serves as a senior advisor on information technology within the US Department of Defense and NATO. He holds a PhD in computer science from the University of Pennsylvania, a BSEE in electrical engineering and an MSE in computer engineering also from the University of Pennsylvania. Dr. Shumaker is a registered Professional Engineer, a Senior Member of the Institute of Electrical and Electronic Engineers (IEEE), a member of the IEEE Computer Society, the Association for Computing Machinery (ACM) and Sigma Xi.

Closing Keynote Address

The Road to the Future
How to Implement Needed Research